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0. INTRODUCTION

This paper describes the most significant segmental morphophonemic processes in the verb stems of Lalana Chinantec[1] (LC). This paper also deals with questions which might be raised concerning the original phonemic analysis (Rensch 1966:455-63).[2]

There are two major types of segmental alternations which take place in LC verb stems. The first type I call vowel shifts. Vowel

shifts take place when there appears on the verb stem either of two homophonous morphemes of the form -n, one marking person and the other animate object. Only a very few verbs are exceptions to these vowel shift rules. The second type of alternation is a palatalization process that affects certain person/tense inflections within the verb paradigm. It causes the fronting of vowels as well as certain related consonant alternations. I posit that palatalization of certain forms within the paradigm is triggered by an underlying y- prefix.

Palatalization is a restricted phenomena. It appears in my data in approximately 110 paradigms out of a corpus of 675 paradigms. The 675 paradigms do not represent 675 verb stem morphemes however. Many paradigms are transitivity variants of the same morphemes. In terms of unique stem morphemes there are only 68 stems which exhibit palatalization. Consequently, in some cases only a few examples will have a considerable impact on the analysis.

The original phonemic analysis, based only on surface forms resulted in a set of co-occurrence restrictions in CV sequences that left some tantalyzing holes in the distributional pattern. The palatalization pattern is also slightly defective in that forms marked for palatalization with initial t, n, or l show vowel fronting, but no evidence of palatalization of the initial consonant. Similarly the consonants ? and h occasionally appear with a y but sometimes do not. The present morphophonemic analysis provides an explanation for these problems by positing the underlying y- prefix and the subsequent treatment of this y.

I cite only forms relevant to this paper, therefore most affixes are omitted. Cited forms have tone notation and some forms have an acute accent (signifying Rensch's post-vocalic h but which may be considered as marking ballistic syllable). These features will not be discussed since they are not relevant to the present discussion. All cited forms are surface forms unless otherwise indicated as in derivations.

1.0 VOWEL SHIFTS

Four rules describe the vowel shifts that result from adding the -n suffix to the verb stem. This suffix is used to represent the morpheme marking verbs for animate object or the morphemes first or second person singular.

1.1 ɑ̆/ɛ̆ Shift.[3] The first vowel shift changes short ɑ to ɛ . The ɑ̆/ɛ̆ Shift may be illustrated by comparing the third person singular of the habitual[4] (3s hab.) with the first person singular habitual (1s hab.).

(1)	3s hab.	1s hab.	gloss
	hwɑ^{32}	hwɛn^{23}	throw
	kwɑ^{23}	kwɛn^{32}	sneeze
	bɑ^{32}	bɛn^{32}	shave
	ɣɑ^{23}	ɣɛn^{23}	put

The forms hwɑ^{32} and ǰɑ^{23} in (1) are transitive and require an inanimate object. The addition of -n marking animate object causes the same vowel shift.

(2)

3s hab. inan.	3s hab. an.	gloss
hwɑ^{32}	hwɛn^{32}	throw
ǰɑ^{23}	ǰɛn^{32}	put

The transitive animate stem has ɛ in all forms because of the presence of -n on all forms to mark animate object.[5]

The presence of a postvocalic ʔ does not hinder the influence of -n. This is seen in the following forms:

(3)

3s comp.	2s comp.	gloss
hwɑʔ^{3}	hwɛʔn^{2}	say

The rule that describes this shift takes the following form:

ɑ̆/ɛ̆ Shift

ɑ̆ → ɛ̆ / _____ (ʔ) n

1.2 ɔ/ɑ Shift. The second vowel shift changes ɔ to ɑ under the same conditions as the previous rule. Examples:

(4)

3s hab.	1s hab.	gloss
kɔ·ʔ^{32}	kɑ·ʔn^{32}	handle
kwɔ·ʔ^{32}	kwɑ·ʔn^{32}	straddle
kɔ·^{23}	kɑ·n^{23}	play
šɔ·^{23}	šɑ·n^{23}	push up
šɔ·ʔ^{32}	šɑ·ʔn^{32}	lift up
ʔɔ·ʔ^{32}	ʔɑ·ʔn^{232}	weep
hnǫ·^{32}	hnɑ·n^{32}	hit
yɔ·^{32}	yɑ·n^{32}	wring

The rule for this shift is written as follows:

ɔ/ɑ Shift

ɔ → ɑ / ___ (ʔ)n

1.3 ɑ̆/ə̆ Shift. The third vowel shift is a refinement of the previous one. Note that in (4) all of the forms cited have long vowels. If the ɔ input to the ɔ/ɑ Shift is short, then the output from that rule will be a short ɑ. That short ɑ then becomes the input for the present rule which shifts a short ɑ to ə. The following examples illustrate the effects of these two shifts:

(5)	3s hab.	1s hab.	gloss
	hwɔ^{32}	hwən^{23}	pick fruit
	lɔ^{32}	lən^{32}	buy
	kɧ^{32}	kɧn^{23}	carry

By means of the following derivations, it is possible to observe the operation of these two shift rules on the first person forms from (5):

(6)	UF	hwɔn^{23}	lɔn^{32}	kɧn^{23}
	ɔ/ɑ Shift	hwɑn^{23}	lɑn^{32}	kɧn^{23}
	ɑ̆/ə̆ Shift	hwən^{23}	lən^{32}	kɧn^{23}

None of the examples in (5) has a postvocalic glottal. Two verbs illustrate the operation of this rule in the presence of a glottal stop. Different inflections are cited here because in these two verbs the effect of this rule is obscured by palatalization in the third person.

(7)	2p hab.	2s hab.	gloss
	hwɔʔ^{3}	hwəʔn^{3}	say
	ʔɔʔ^{3}	ʔəʔn^{3}	sweep

This rule does not operate exclusively on the output of ɔ/ɑ Shift. There is one verb which is exceptional to ɑ̆/ɛ̆ Shift but which is operated on by this rule:

(8)	3s hab.	1s hab.	gloss
	tɑ^{23}	tən^{23}	scrape

The following rule accomplishes this shift:

ɑ̆/ə̆ Shift

ɑ̆ → ə̆ / ____(ʔ)n

1.4 ü/u Shift. The vowel ü shifts to u in the presence of -n (ü does not occur in surface forms as there is a late rule which lowers ü to ö. Therefore, cited forms all appear with ö). Examples in (9) illustrate this shift.

(9)

3s hab.	1s hab.	gloss
yö·^{32}	yu·n^{32}	dig
yǫ̈·?^{32}	yų?n^{32}	suck
hyö·^{32}	hyu·n^{32}	blow
kyǫ̈·^{23}	kyų·n^{23}	knock
ŋyǫ̈^{32}	ŋyųn^{32}	vomit
?ŋyǫ̈·^{3}	?ŋyų́·n^{23}	tie
hŋyǫ̈·^{23}	hŋyų·n^{23}	rub
šǫ̈·?^{23}	šų·?n^{23}	lick

An example of this shift following ǰ is the addition of animate marking -n to the stative verb *good*.

(10)

3s hab. inan.	3s hab. an.
ǰö^{23}	ǰún^{23}

There is, however, one condition on the operation of this shift that distinguishes it from the other vowel shifts. The ü/u Shift takes place only when the vowel follows a palatal consonant (y, š, ǰ). Examples:

(11)

3s hab.	1s hab.	gloss
lö^{23}	lön^{23}	speak
nǫ̈^{32}	nǫ̈n^{32}	roll
tö·?^{32}	tö·?n^{23}	cut
tö·^{23}	tö·n^{23}	trill

This rule is written as follows:

ü/u Shift

ü → u / [+palatal] _____(?)n

1.5 Shift Rule Ordering. The first three shift rules presented must be ordered with respect to each other. As was noted in (6) ɔ/ɑ Shift

feeds ă/ə Shift when the underlying ɔ is short. Reversing that order produces the following results:

(12)	UF	hwɔn^{23}	lɔn^{32}	kǫn^{23}
	ă/ə Shift	------	------	------
	ɔ/ɑ Shift	*hwɑn^{23}	*lɑn^{32}	*kǫn^{23}

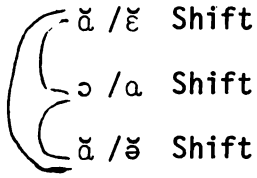
The ă/ɛ Shift rule must be ordered so that it cannot be fed by ɔ/ɑ Shift. Otherwise, we will generate the improper forms in (13) and in addition bleed the input of ă/ə Shift.

(13)	UF	hwɔn^{23}	lɔn^{32}	kǫn^{23}
	ɔ/ɑ Shift	hwɑn^{23}	lɑn^{32}	kǫn^{23}
	ă/ɛ Shift	*hwɛn^{23}	*lɛn^{32}	*kɛ̨n^{23}
	ă/ə Shift	-------	------	------

The derivations in (12) and (13) demonstrate that ă/ɛ Shift may not intervene between ɔ/ɑ Shift and ă/ə Shift. Neither must ă/ɛ Shift follow ă/ə Shift. To do so would be to bleed it of all input. Using the data from (1) we derive the following forms:

(14)	UF	hwɑn^{23}	bɑn^{32}	ǰɑn^{23}
	ă/ə Shift	*hwən^{32}	*bən^{32}	*ǰən^{23}
	ă/ɛ Shift	-------	------	------

Thus we find these three rules in the following ordering relationships:



ü/u Shift does not interact with the other three vowel shift rules. However, this rule must be ordered after the above rules as will be shown later.

1.6 Exceptions.[6] There is one verb that is an exception to ă/ɛ Shift. The verb tɑ^{23} *scrape* does not undergo this shift, but falls through to ă/ə Shift, as was shown in (8).

The four verbs in (15) are exceptions to ɔ/ɑ Shift. They meet the structural description of this rule, but undergo no vowel shifts.

(15)

3s hab.	1s hab.	gloss
hɔ·^{32}	hɔ·n^{23}	look at (obj. inan.)
hɔ·n^{32}	hɔ·n^{23}	look at (obj. animate)
kɔ·ʔn^{3}	kɔ·ʔn^{232}	mix
ʔɔ^{32}	ʔɔn^{23}	dig

2.0 PALATALIZATION

Palatalization in LC verb stems can be accounted for by a set of ordered rules that interact with the vowel shift rules. Selected forms within the verb paradigm undergo palatalization as a result of the y- prefix. There are three patterns of palatalization within a paradign as illustrated in the following:

(16) a.

	1s	1p	2s	2p	3s
hab.		xx			
pot.		xx			
comp.		xx	xx	xx	

b.

	1s	1p	2s	2p	3s
hab.		xx			xx
pot.		xx			xx
comp.		xx	xx	xx	xx

c.

	1s	1p	2s	2p	3s
hab.					
pot.	xx	xx	xx	xx	xx
comp.					

In (16) the areas filled by xx indicate those forms which become palatalized. The first two patterns (16a) and (16b) will be referred to as patterns L and U respectively (because of the shapes of the areas filled by xx).[7] The U pattern is also important with regard to a rule to be discussed under miscellaneous rules. The pattern in (16c) will be referred to as pattern P referring to palatalization on the potential aspect only.

There are also paradigms in which palatalized forms occur in all inflections. Verbs of that type exhibit alternations due to vowel shift rules, but show no alternation attributable to palatalization. Since there is no direct evidence that such verbs are derived from underlying non-palatalized stems, I will consider them as spelled in their palatalized form rather than derived from the rules to be described.

I have already stated the hypothesis that an underlying y- prefix provides the environment for palatalization.[8] The y- is rarely evident in surface forms, but its effects remain. In most instances y is deleted by a late rule. In all other instances it appears pre-vocalically either as part of a consonant cluster or as the onset by itself. In a later section some derivations will be given demonstrating what becomes of the y.

The rules to be described are ordered, but in the interest of a more logical presentation they are not presented in order of application. A discussion of ordering will follow.

2.1 Vowel Fronting. The most readily observed result of palatalization in surface forms is the fronting of vowels. LC vowels pattern as follows:

(17)

front	+	-	-
back	-	-	+
hi lo			
+ -	i ü	ɨ	u
- -	ɛ	ə	
- +		ɑ	ɔ

The two high front vowels i and ü could be distinguished by the feature [labial]; however for the purposes of this paper we do not need to make that distinction.

The presence of a palatal consonant preceding vowels causes vowels to be fronted. There is fronting alternation between the following vowel pairs, ɨ-i, u-ü, ə-ɛ, and ɔ-ɑ. The following forms illustrate vowel fronting:

(18)

2p hab.	1p hab.	gloss	pattern
ʔɨ·ʔ^{3}	ʔi·ʔ^{3}	poke	L
tə·^{32}	tɛ·^{32}	call (trans.)	L
tə^{3}	tɛ^{3}	call (intrans.)	L
tu·^{3}	tö·^{3}	defecate	L
u·^{3}	yö·^{3}	extinguish	U

Note that in (18) there are no examples of ɔ-ɑ alternation. The alternation of these vowels involves some special complications and is treated in a later section. Thus the Vowel Fronting Rule will only operate on vowels marked [-low].

The examples in (18) are surface forms and have no evidence of the y- prefix. The Vowel Fronting Rule will be written showing the environment [+palatal] before the vowel which is fronted. Rules to be described later will explain how this environment came to be. The Vowel Fronting Rule takes the following form:

Vowel Fronting

$$\begin{bmatrix} V \\ -low \\ -front \end{bmatrix} \longrightarrow [+front] \;/\; [+palatal] \_\_\_\_$$

2.2 Y Metathesis. I have been describing the y, which causes palatalization, as a prefix, but as the Vowel Fronting Rule is written, Vowel Fronting can take place in a sequence such as CyV. The repositioning of y adjacent to vowels is accomplished by a metathesis rule:

Y Metathesis

$$yC_1 \Longrightarrow C_1y$$

2.3 Y Coalescence. Y Metathesis also sets the stage for the palatalization of sibilants s and z to š and ǰ respectively. This rule operates when y appears next to the sibilant as a result of metathesis. The following examples demonstrate the alternation of palatal and nonpalatal sibilants.

(19)[9]	3s hab.	1p hab.	gloss	pattern
	sɨʔ^{23}	šɨ·ʔ^{32}	tell	L
	sɥʔ^{23}	šɵ̈·ʔ^{232}	break	L
	sɔ·^{3}	šɔ·^{3}	boil	L
	zɔ·^{23}	ǰɔ·^{23}	exhaust	P

This rule is written:

Y Coalescence

$$\begin{matrix} C \\ [+sibilant] \\ 1 \end{matrix} \quad \begin{matrix} y \\ 2 \end{matrix} \Longrightarrow \quad \begin{matrix} [+palatal] \\ 1 \end{matrix} \quad \begin{matrix} \emptyset \\ 2 \end{matrix}$$

The effect of the coalescence is the palatalization of consonants. If the consonant has the feature [+palatal] that is all that is necessary to meet the conditions of the structural description of Vowel Fronting. This rule (in combination with a later rule) also explains the absence of y following š and ǰ in surface forms.

2.4 ɔ Fronting. When preceded by y, the vowel ɔ fronts to ɑ. The following examples attest this alternation.

(20)	2p hab.	1p hab.	gloss	pattern
	tɔ·3	tɑ·3	cook	L
	lɔ́·3	lɑ·23	begin	L
	lɔ·ʔ2	lɑʔ232	bathe	L
	ʔɔ·3	ʔɑ·3	guard	L
	hwɔʔ3	hwɑ·ʔ3	say	U

The forms in (20) are derived as follows:

(21)	UF	y+tɔ·3	y+lɔ·23	y+lɔ·ʔ2	y+hwɔʔ3	y+ʔɔ·3
	y Meta.	tyɔ·3	lyɔ·23	lyɔ·ʔ2	hwyɔʔ3	ʔyɔ·3
	ɔ Front.	tyɑ·3	lyɑ·23	lyɑ·ʔ2	hwyɑʔ3	ʔyɑ·3
	OR[10]	tɑ·3	lɑ·23	lɑ·ʔ2	hwɑʔ3	ʔɑ·3
	SF	tɑ·3	lɑ·23	lɑ·ʔ2	hwɑʔ3	ʔɑ·3

ɔ Fronting is more restricted in its operation than Vowel Fronting. While Vowel Fronting operated following any palatal, ɔ fronting operates only following y. The following verbs force this restriction.

(22)	3s hab.	1p hab.	gloss	pattern
	sɔ·3	s̆ɔ·3	boil	L

	3s comp.	3s pot.	gloss	pattern
	ʒɔ·23	j̆ɔ·23	exhaust	P
	ʒɔʔ23	j̆ɔʔ23	find	P

This rule is further restricted in that it does not operate on ɔ following all y's. There are verbs which are palatal in all inflections, as well as nouns, that do not undergo ɔ fronting. Consider the following:

(23)	hyɔ·32	lower
	yɔ̱·32	wring
	yɔ·ʔ23	shout
	ʔyɔ·ʔ3	jaguar
	ʔyɔ·3	sunshine

Thus the ɔ Fronting Rule must prevent the fronting of ɔ following those words which are spelled with a y in the stem by the lexical insertion rules. This can be done by placing a morpheme boundry marker following the y in the structural description of this rule. Thus, the underlying form for *he guards* is written as y+ʔɔ·^{3}. I treat the boundry marker here not as an abstract segment, but as a global reference to the underlying form (cf. Pyle, 1972). The ɔ Fronting rule now reads as follows:

ɔ Fronting

ɔ ⟶ ɑ /y+____

2.5 ɑ Fronting. There is one further complication associated with the fronting of ɔ . If the ɔ operated on by ɔ Fronting is nasalized the output from that rule is further fronted to ɛ. Examples.

(24)	2s hab.	1p. hab.	gloss	pattern
	tɔ·^{3}	tɛ·^{3}	throw	L
	tɔ·ʔ^{3}	tɛʔ^{232}	insert	L
	ʔnɔʔ^{3}	ʔnɛ·ʔ^{232}	search for	L
	ʔnɔ·^{3}	ʔnɛ·^{3}	gather	L
	kɔ^{3}	kyɛ^{3}	carry	L
	hɔ^{3}	hɛ^{23}	wait for	U
	nɔ́^{3}	nɛ^{32}	open	U

A preliminary form of this rule may be written as in (25).

(25) ɑ ⟶ ɛ

However, the rule appears to operate only on vowels that are output from ɔ Fronting. While there are examples of verbs with ɑ in all inflections, it is not clear what their relationship is to the rule in (25). All examples that I have of verbs of this type have stems that terminate with an -n. Thus, a verb such as yɑʔn^{3} *he owes* could be interpreted in two ways. If it is assumed that the surface form is the same as the underlying, then such a verb is exceptional to this rule. This would support the interpretation that this rule only operates on output from ɔ Fronting. The verb yɑʔn^{3} may also be interpreted as having the underlying form of yɔʔn^{3}. In this case ɔ/ɑ shift would give the surface from yɑʔn^{3} (as will be seen later ɔ/ɑ shift is ordered after ɑ Fronting). Thus, in the absence of any clear evidence to the contrary, I choose to interpret this rule as operating only on output from ɔ Fronting. To accomplish this the rule must be written with a global constraint which limits this rule to operating on an ɑ which is underlying ɔ. The rule (25) can now be specified more fully.

ɑ Fronting

$$ɑ \longrightarrow ɛ \; / \; [\langle +back \rangle]$$

I have used the notational innovation of <+back> to indicate an underlying environment.[11]

2.6 Y Deletion. Three y deletion rules operate to remove y from various environments. It is the operation of these rules which obscures palatalization in surface forms by deleting the motivating environment for palatalization.

In verb stems where ɨ fronts to i as a result of Vowel Fronting, the y which supplied the environment for Vowel Fronting never appears on the surface. In (26) underlying forms are compared to surface forms to illustrate this y deletion.

(26)	UF	SF	gloss
	y+hɨ·ʔ^3	hi·ʔ^3	we smell
	y+hɨ^3	hi^3	we burn
	y+ʔɨ^3	ʔi^3	we count
	y+ʔɨ·ʔ^3	ʔi·ʔ^3	we drink
	y+gɨ·^{3}	gi·^{3}	we tear
	y+kɨ^{232}	ki^{232}	we pay
	y+hnɨ^3	hni^3	we close

It is clearly not the case that y deletion in the forms of (26) is conditioned by the consonants. We see for example that y is not deleted from the palatalized stem kyɛn^3 *you carried*, but the y is deleted following k in the verb *pay* in (26). It may also be observed that throughout the language there are sequences such as those in (27).

(27)	ʔyö	hyö	gyɑn	kyɑn
	ʔyɔ	hyɔ	gyɛn	kyö
			gyö·ʔ	

On the other hand there are no examples of y before i anywhere in the language. Therefore this y deletion is represented by the following rule:

Y Deletion I

$$y \longrightarrow Ø \; / \; \_\_\_\_ \; i$$

Y deletion occurs under another set of conditions which are illustrated by the data in (28).

(28)

UF	SF	gloss
y+hɔn^{232}	hɛn^{232}	we call
y+hɚ^{3}	hɚ^{3}	we wait for
y+ʔɔ^{3}	ʔɛ^{3}	we talk about
y+ʔɔ·^{3}	ʔɑ·^{3}	we guard

Note that all of the initial stem consonants in (28) are laryngeals. The following vowels likewise fall into a class that can be described as [-back, -hi]. In (26) we saw laryngeals followed by y and in (24) one verb with a y before ɛ. This demonstrates that the deletion of y in (28) has a consonant as well as a vowel environment. The feature description for the vowel environment given above includes the vowel ə which does not appear in any examples in (28). This vowel would never appear following y once Vowel Fronting has operated. Thus, if we assume the the current y deletion rule will be ordered after Vowel Fronting, the ə is irrelevant in the environment of this rule. I will tentatively write this rule as follows:

(29)

$$y \longrightarrow \emptyset / [+\text{laryngeal}]\_\_\_\_ \begin{bmatrix} V \\ -\text{back} \\ -\text{hi} \end{bmatrix}$$

The rule in (29) is not entirely adequate as written. The word hyɑ·ʔ^{31} *where?* is exceptional to this formulation of the rule. It is also possible to derive forms which are exceptional by the operation of ɔ/ɑ Shift on verbs which are spelled as palatalized in the underlying form such as hyɔ·^{32} *he lowers*, which becomes hyɑ·n^{32} *I lower* by the addition of -n. These data show that stems spelled with a y in the underlying form must be distinguished from those with a y- prefix. As in ɔ Fronting, that may be done by inserting a morpheme boundry marker. This rule is then ammended to read:

Y Deletion II

$$y \longrightarrow \emptyset \ / \ [+\text{laryngeal}] \ \_\_\_\_ + \begin{bmatrix} V \\ -\text{back} \\ -\text{hi} \end{bmatrix}$$

There is a third y deletion rule the effects of which are illustrated by the stem forms in (30).

(30)

UF	SF	gloss
y+tɔ·ʔ^{32}	tɑ·ʔ^{32}	we insert
y+tu·^{3}	tö·^{3}	we defecate
y+tɔ·ʔn^{232}	tɑ·ʔn^{232}	we drop
y+lɔ^{232}	lɑ^{232}	we buy
y+nɥ·^{3}	nö·^{3}	we hear
y+ʔnɚ·ʔ^{232}	ʔnɛ·ʔ^{232}	we search for
y+hwɔʔ^{3}	hwɑ·ʔ^{3}	we say
y+hwə·ʔn^{232}	hwɛ·ʔn^{232}	we frighten

The examples in (30) are selected from among a large number of verb stems that behave in the same way. The vowels in those examples in (30) represent the complete LC vowel system with the exception of ɨ and ɪ which will have been accounted for if Y Deletion I is ordered before this rule. The consonants that precede y in those examples are ṭ, ṇ, ɭ, and w. Those consonants do not form a natural class, but in order to talk about an appropriate consonant environment it is necessary to look at the complete LC consonant system.

(31)

p	t	k	ʔ
b		g	
	s		
	ʒ		
m	n	ŋ	
w	l	y	
	r		h

The consonants p, b, m, and r never occur in palatalized stems and are therefore irrelevant to y deletion. Velars k, g, and ŋ, are the only consonants that do not lose following y's except for the limited deletion following laryngeals. Sibilants s and ʒ either coalesce with a following y or are palatalized by a rule to be described later. Thus, sibilants are also irrelevant here. It is possible to describe the environment for this rule by saying y deletes following all consonants except velars and laryngeals. This can be done by referring to all non-velars as [-hi, - back]and non-laryngeals as [+consonantal]. It is now possible to write this rule.

Y Deletion III

$$y \longrightarrow \emptyset \; / \; \begin{bmatrix} +\text{consonantal} \\ -\text{hi} \\ -\text{back} \end{bmatrix} \_\_\_\_$$

2.7 Miscellaneous Rules. One small class of consonant alternations and some pronunciation adjustments remain to be accounted for.

Some verb stems beginning with sibilants alternate with other consonants in the first and second person forms. In these verbs s and š may alternate with h, hw, or hm and ʒ and ǰ alternate with gw. All verbs that alternate in this way are also palatalizing verbs. The examples in (32) represent the complete list of such stems found in my data.

(32)

2p hab.	1p hab.	gloss	pattern
hwi·ʔ^{32}	ši·ʔ^{32}	tell	L
hwəʔ^{3}	šɛ·ʔ^{232}	drag	L
hmʒʔ^{2}	šɐ̨·ʔ^{3}	grab	L
hwəʔn^{23}	šɛʔn^{23}	pull out	L
hɥʔ^{3}	šɵ̈·ʔ^{232}	break	L
hɥ·n^{23}	šɥ·n^{232}	tease	U
gwə́n^{2}	ǰə́n^{2}	dance	L
gwɔ^{3}	ǰi^{3}	grind[12]	L

The following paradigms are typical of these verbs.

(33) a. *dance*

	1s	1p	2s	2p	3s
hab.	gwən^{23}	ǰə́n^{2}	gwə́n^{2}	gwə́n^{2}	ʒən^{23}
pot.	gwən^{31}	ǰə́n^{2}	gwə́n^{2}	gwə́n^{2}	ʒən^{23}
comp.	gwə́n^{2}	ǰə́n^{2}	ǰə́n^{2}	ǰə́n^{2}	ʒən^{23}

b. *drag*

	1s	1p	2s	2p	3s
hab.	hwə·ʔn^{32}	šɛ·ʔ^{232}	hwə·ʔn^{3}	hwə·ʔ^{3}	səʔ^{23}
pot.	hwə·ʔn^{31}	šɛ·ʔ^{232}	hwə·ʔn^{2}	hwə·ʔ^{2}	səʔ^{23}
comp.	hwə·ʔn^{2}	šɛ·ʔ^{232}	šɛ·ʔn^{23}	šɛ·ʔ^{23}	səʔ^{23}

Both of the paradigms in (33) follow the typical L pattern of palatalization, but the sibilant initial stems fill a U pattern and the gw and h initial forms fill the complement of the U pattern. There appears to be no phonological motivation for ʒ to g or s to h alternation

in these verbs. Therefore I posit the following minor rule that accomplishes these alternations.

Lenition

$$\begin{Bmatrix} s \\ ʒ \end{Bmatrix} \longrightarrow \begin{Bmatrix} h \\ g \end{Bmatrix}$$

In positing this rule I am also positing that those forms which undergo this rule are marked by the feature [+lenition] in the lexicon. By implication all other forms in the language are marked [-lenition].

In the case of those verbs such as *dance* in (33a) that also have a w, I also posit the following underlying forms for the habitual aspect.

(34) *dance*

	1s	1p	2s	2p	3s
hab.	ʒwən^{23} [+lenition]	y+ʒwə́n^{2}	ʒwə́n^{2} [+lenition]	ʒwə́n^{2} [+lenition]	ʒwən^{23}

Clusters consisting of sibilant followed by w are not permitted in LC surface forms. Therefore a w deletion rule is needed. I give a tentative formulation here.

(35) $$w \longrightarrow \emptyset \; / \; \underset{[+\text{sibilant}]}{C} \; \_\_\_\_$$

The w that remains following an h in verbs of this type will become m preceding a nasalized vowel. This can be seen in the potential aspect of the verb *grab*.

(36) *grab*

	1s	1p	2s	2p	3s
pot.	hmę?n^{31}	šę·?^{2}	hmę?n^{2}	hmǫ?^{2}	sǫ?^{2}

A rule for nasalization of w may now be formulated.

Labial Nasalization

$$w \longrightarrow m \; / \; s \; \_\_\_\_ \; \underset{[+\text{nasal}]}{V}$$

The s in this rule is necessary because there are instances of before nasalized vowels in the language such as wɨ·^{3} *vine*, wɬ·^{3} *far* .

One further complication is caused by the sibilant plus w clusters. There are no instances of s and ʒ before front vowels in LC. However, after w is deleted just such sequences result from the current form of the rules. The derivations in (37) demonstrate this problem.

(37)	*we dance*	*we tell*
UF	y+ʒwə́n^{2}	y+swɨ·ʔ^{32}
Y Metathesis	ʒwyə́n^{2}	swyɨ·ʔ^{32}
Y Coalescence	-------	-------
OR	ʒwɛ́n^{2}	swi·ʔ^{32}
W Deletion	*ʒɛ́n^{2}	*si·ʔ^{32}

This situation arises because the presence of w blocks the operation of Y Coalescence leaving some sibilants unpalatalized. To correct this problem the following rule is formulated.

Sibilant Palatalization

$$\overset{C}{[+\text{sibilant}]} \longrightarrow [+\text{palatal}] \;/\; \underline{\quad} \; \overset{V}{[+\text{front}]}$$

It is interesting to note here that the operation of Sibilant Palatalization and Y Coalescence are not limited to operating only on stems which prefixed with y- in the underlying form. These two rules will generate every occurence of palatalized sibilants in LC. The claim that this abstract analysis makes is that there are no underlying palatalized sibilants and that they are in complementry distribution with s and ʒ ,i.e. š and ǰ occur before front vowels and before underlying y, while s and ʒ occur elsewhere. This is not consistent with the restrictions that Rensch observed (1966:463)when he noted that š, ǰ occur before i, ö, u, ɛ, ɑ, ɔ, but that s, ʒ occur before ɨ, u, ə, ɑ, ɔ. But the overlap in these two sets can be explained on the basis of rules that I have already discussed. The only time that u follows š and ǰ is in a sequence like šun where the u is the output of ü/u Shift. The only time ɔ and a follow š and ǰ is when there is an underlying sequence like syɑ, syɔ, or y+sɔ. Underlying sequences such as syɑ and syɔ are not unrealistic since they parallel the underlying sw sequences that have already been posited.

Ordering of the rules which generate the forms in (32) is crucial and forces a modification of the rule that deletes w. We saw in (33) that the underlying w only remained in the surface forms that no longer had a sibilant onset. It is clear then, that Lenition must be ordered ahead of w deletion in order that all of the w's not be deleted. This is illustrated by thé following derivations.

(38)	*I dance*		*I dance*
UF	ʒwən^{23}	UF	ʒwən^{23}
W Deletion	ʒən^{23}	Lenition	gwən^{23}
Lenition	*gən^{23}	W Deletion	------

Labial Nasalization must be ordered ahead of Lenition in order that it not be bled by removal of the initial s necessary for its environment. It would not be adequate to replace s in the environment with an h because there are verbs like hwi^{32} *he chews* which would then be exceptions to the rule. Another derivation illustrates the necessity for this ordering.

(39)	*I will grab*		*I will grab*
UF	swę?n^{31}	UF	swę?n^{31}
Lenition	*hwę?n^{31}	Lab. Nasalization	smę?n^{31}
Lab. Nasalization	-----	Lenition	hmę?n^{31}

The following ordering hás now been established.

Labial Nasalization
Lenition
W Deletion

However, it is now apparent that the present form of W Deletion is inadequate since by ordering Labial Nasalization first some m's are created following s . Presently there is no rule that eliminates m following s. This situation is remedied by rewriting W Deletion as Labial deletion.

Labial Deletion

$$[+\text{labial}]_{C} \longrightarrow \emptyset \;/\; [+\text{sibilant}]_{C} \_\_\_\_$$

Labial Deletion feeds Sibilant Palatalization by removing any m or w that might separate sibilants from a following front vowel. The ordering relationships of these four rules is shown below.

Labial Nasalization
Lenition
Labial Deletion
Sibilant Palatalization

Two remaining rules take care of some pronunciation adjustments. The fronted form of the vowel u is never realized in surface forms as ü. It is lowered to the vowel ö. Therefore I formulate the following rule:

ü Lowering

ü ⟶ ö

Y Deletion I removes all y's before ɨ. However, the sequence

ŋi has a noticeable palatal quality. To account for this I propose the following rule:

ŋ Palatalization

$$ŋ \longrightarrow ŋ^{Y} / \_\_\_\_ i$$

2.8 Exceptions. There a few verbs that are exceptional to the palatalization rules described in section 2.

The verb *sweep* is exceptional to ɔ Fronting. As this rule is written the expected form for *he sweeps* would be *ʔɑʔ^{3} but the actual surface form is ʔyɔʔ^{3}. The only way such a form could arise is if it failed to undergo ɔ Fronting. Then, because it still has a back vowel, it would fail to undergo Y Deletion I and would retain the y. It is possible to reformulate ɔ Fronting to account for this verb, but that would result in the verb ʔɑ·^{3} *he guards* becoming exceptional.

The verb *rinse corn* is exceptional to Y Deletion II. All of the palatalized forms of this verb appear as ʔyɛn. These forms all meet the structural description of the rule but fail to undergo it. The form ʔyɛ·ʔn^{3} *you swept* is likewise exceptional to this same rule.

One verb presents a unique situation. Consider the following forms:

(40)	UF	2p hab.	1p hab.	gloss	pattern
	ʔɔ	ʔɔ^{3}	ʔɛ^{3}	discuss	U

It is not clear where the ɛ came from in the palatalized form. There are only two possible rules that could generate an ɛ by deriving it from an ɔ. One rule would be ă/ĕ Shift operating on the output of ɔ Fronting. But the form in (40) has no final n and does not qualify as input to that rule. The second possibility is that ɔ Fronting operated on it, but this explanation is wrong because the vowel in the verb in question is an oral vowel. Even if ɔ Fronting could be reformulated to account for the verb *discuss*, the generalization of nasalized ɔ becoming nasalized ɛ would have been lost. Consequently, I treat this verb as irregular and make no attempt to explain the source of ɛ.

3.0 RULE ORDERING

Shift rules have already been discussed and their order with respect to each other established. Likewise the four rules associated with sibilants and w have been similarly discussed. Next I want to deal with the Y Deletion rules as a block. Y Deletion I and Y Deletion III are in a mutually bleeding relationship. However, it is of no consequence if one applies before the other. This situation is merely the result of overlapping environments and where the environment overlaps, y must be deleted by whichever can do the job. Therefore, I will arbitrarily order these two rules according to their names, ordering Y Deletion I before Y Deletion III. Y Deletion II does not interact with the other two rules and I will order it by name also. The following are the ordering relationships for Y Deletions:

Y Deletion I
Y Deletion II
Y Deletion III

Y Coalescence must be ordered before ɔ Fronting in order to bleed it of the appropriate input. Y Metathesis must precede Y Coalescence in order that the y to be coalesced will be in the proper position. These orderings are illustrated in (41).

(41)

	he will exhaust		
UF	y+ʒɔ·^{23}	UF	y+ʒɔ·^{23}
Y Metathesis	ʒyɔ·^{23}	Y Metathesis	ʒyɔ·^{23}
ɔ Fronting	ʒyɑ·^{23}	Y Coalescence	ǰɔ·^{23}
Y Coalescence	ǰyɑ·^{23}	ɔ Fronting	-----
SF	*ǰyɑ·^{23}	SF	ǰɔ·^{23}

Since I have already described ɑ Fronting as operating only on the output of ɔ Fronting, it is obvious that it must follow ɔ Fronting. In order to prevent ɔ Fronting from receiving input from any other source it is necessary to order ɔ/ɑ Shift after ɑ Fronting. The ordering of the shift rules has already been established. In (42) the ordering of shift rules with the other early rules just discussed is presented.

(42)

Y Metathesis
Y Coalescence
ɔ Fronting
ɑ Fronting
ɑ̆/ɛ̆ Shift
ɔ/ɑ Shift
ɑ̆/ə̆ Shift

There is a mutually bleeding relationship between ɑ Fronting and ɑ̆/ɛ̆ Shift. But it is irrelevant which rule is ordered first since they produce the same output.

Vowel Fronting must be ordered following the rules in (42). There is one verb form that makes this clear. The verb stem ʔyɛ·ʔn^{3} *you swept* demonstrates that ɑ̆/ə̆ Shift can sometimes feed Vowel Fronting. This situation is also dependent on the fact that that *sweep* is exceptional to ɔ Fronting. The following derivation demonstrates how Vowel Fronting is fed by ɑ̆/ə̆ Shift.

(43)

	you swept
UF	y+ʔɔʔn^3
Y Metathesis	ʔyɔʔn^3
Y Coalescence	-----
ɔ Fronting	-----
ɑ Fronting	-----
ɑ̈/ɛ Shift	-----
ɔ/ɑ Shift	ʔyɑʔn^3
ɑ̈/ə Shift	ʔyəʔn^3
Vowel Fronting	ʔyɛʔn^3
SF	ʔyɛʔn^3

To order Vowel Fronting earlier would result in a form like *ʔyəʔn^3.

It should be obvious that Y Deletion III must follow both Vowel Fronting and ɔ Fronting. To order Y Deletion III before these rules would bleed them if almost all input by removing y's that are crucial to both fronting rules. Y Deletion I must also follow Vowel Fronting as the derivation in (44) demonstrates.

(44)

a.	*we pay*	b.	*we pay*
UF	y+kɨ^{232}	UF	y+kɨ^{232}
Y Metathesis	kyɨ^{232}	Y Metathesis	kyɨ^{232}
Y Deletion I	----	Vowel Fronting	kyi^{232}
Vowel Fronting	kyi^{232}	Y Deletion I	ki^{232}
SF	*kyi^{232}	SF	ki^{232}

The derivations in (44) make it clear that the rules must be ordered so that Vowel Fronting will feed Y Deletion I.

The ordering of Y Deletion II is not as critical based on the data at hand. It is possible to order it before Vowel Fronting. I will order this rule after Vowel Fronting on the basis of a form that could possibly exist but does not occur in my data. If the underlying sequence y+hə should ever turn up the application of Y Metathesis and Vowel Fronting would change it to hyɛ. Such a sequence must have the y deleted to conform to LC surface constraints.

ü/u Shift must be ordered with respect to Y Deletion III. It was noted above that this shift unlike all of the others requires a pre-vocalic palatal. Y Deletion III must bleed away some forms.

(45) a.	*you defecated*	b.	*you defecated*
UF	y+tu·n^3	UF	y+tu·n^3
Y Metathesis	tyu·n^3	Y Metathesis	tyu·n^3
Vowel Fronting	tyü·n^3	Vowel Fronting	tyü·n^3
ü/u Shift	tyu·n^3	Y Deletion III	tü·n^3
Y Deletion III	tu·n^3	ü/u Shift	-----
OR	-----	OR	tö·n^3
SF	*tu·n^3	SF	tö·n^3

It is clear from these data that ü/u Shift must follow Y Deletion III.

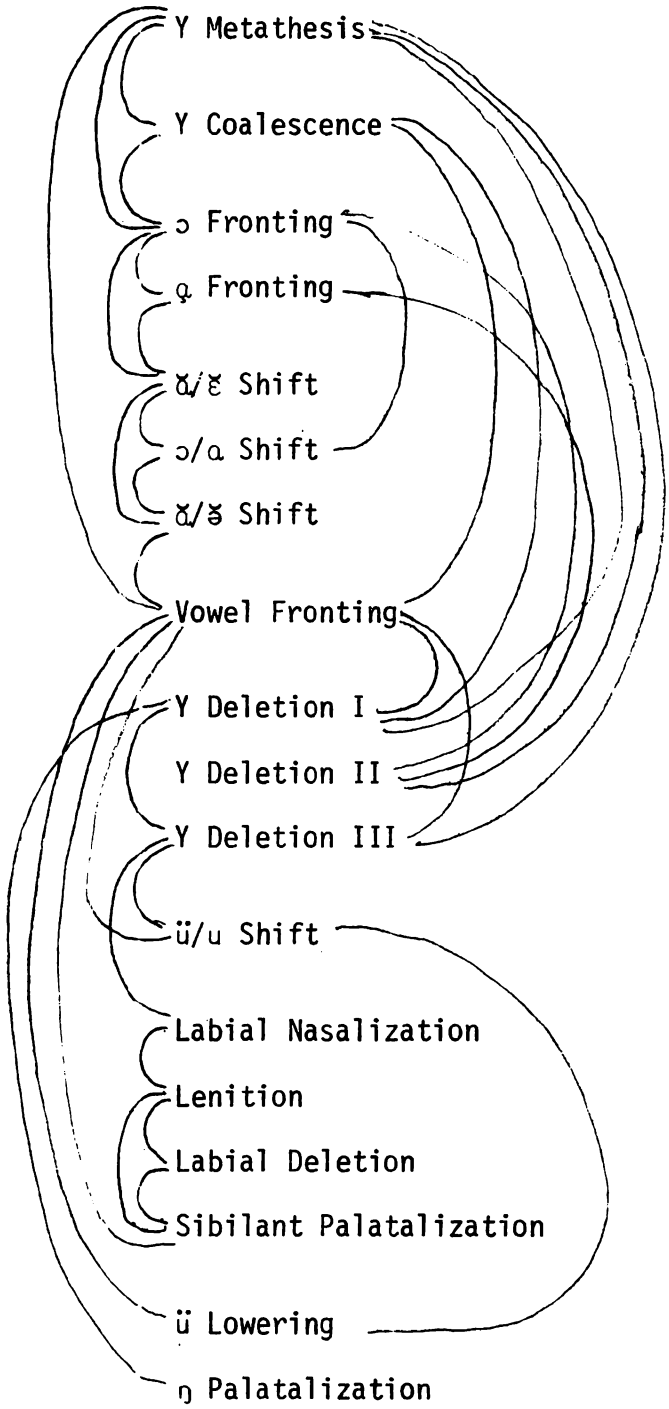
The relative ordering of the four rules that are associated with the alternation sibilants with h and g has been established. Those four rules interact with Y Deletion III. The latter rule feeds Labial Nasalization and Sibilant Palatalization. Two derivations will clarify this ordering.

(46) a.	*we grab*	b.	*we grab*
UF	y+swɔ·?^{3}	UF	y+swɔ·?^{3}
OR	swyɛ·?^{3}	OR	swyɛ·?^{3}
Lab. Nas.	------	Y Deletion III	swɛ·?^{3}
Lenition	------	Lab. Nas.	smɛ·?^{3}
Lab. Deletion	syɛ·?^{3}	Lenition	------
Sibilant Pal.	------	Lab. Deletion	sɛ·?^{3}
Y Deletion III	sɛ·?^{3}	Sibilant Pal.	šɛ·?^{3}
SF	*sɛ·?^{3}	SF	šɛ·?^{3}

The ordering in (46a) has produced a non-permissable surface sequence. The latter four rules in (46b) do not interact with ü/u Shift, but I have chosen to order them following that rule.

The last two rules that need to be accounted for are ü Lowering and ŋ Palatalization. ü Lowering must be ordered following ü/u Shift since the latter must bleed the former. Y Deletion I feeds ŋ Palatalization and must be ordered prior to it. I chose to order both of the pronunciation adjustments last.

All orderings have now been established and following is a summary of the ordering and the ordering relationships of the total system.


Y Metathesis
Y Coalescence
ɔ Fronting
ɑ Fronting
ɑ/ɛ Shift
ɔ/ɑ Shift
ɑ/ə Shift
Vowel Fronting
Y Deletion I
Y Deletion II
Y Deletion III
ü/u Shift
Labial Nasalization
Lenition
Labial Deletion
Sibilant Palatalization
ü Lowering
ŋ Palatalization

4.0 CLEAN SPEECH VS. DIRTY SPEECH

LC speakers may be divided into two sub-dialects which may be designated clean speakers and dirty speakers. These names are derived from clean speakers who claim that they speak clearly (hɨn^{23} lö^{2}rɑʔ^{31} *we (ex.) speak clearly*) and that practitioners of dirty speech do not (ʔɑ^{23}hyaʔ^{3} hɨn^{23} lö ^{23} *they dc not speak clearly*). A more technically appropriate designation might be conservative speech (clean) and innovative speech (dirty). I shall continue to use the less technical terms.

These two groups have a number of distinguishing characteristics, but the changes in the vowel system are of particular interest here because of the adjustments in the analysis that they require. The analysis that has been presented in sections 1.0 and 2.0 is representative of dirty speech. Clean speech has two additional vowel contrasts. The system in (47) represents the clean speech vowel system.

(47)

front	+	-	-
back	-	-	+
hi	lo		
+	-	i ü ɨ	u
-	-	ɛ ə	ɔ
-	+	a ɑ	ɒ

This system has the additional vowels a and ɒ . For dirty speakers, these two vowels have been neutralized in the following ways: a ⟶ ɑ and ɒ ⟶ ɔ . The forms (48) illustrate these contrasts and neutralizations.

(48)

Clean Speech	Dirty Speech	gloss
tɑ^{2}	tɑ^{2}	work
ʒɑ^{3}	ʒɑ^{3}	person
lá^{3}	lá^{3}	trap
ʔa·^{3}	ʔɑ·^{3}	he guards
hɔ·^{32}	hɔ·^{32}	he looks at
hɒ·^{32}	hɔ·^{32}	he spreads

The data in (48) help to clear up one problem mentioned earlier. In (15) the verb *he looks at* is listed as one of the verbs that fails to undergo ɔ/ɑ Shift. The homophonous verb hɔ·^{32} *he spreads* does undergo that rule. But notice that these verbs are not homophonous for clean speakers and that ɔ functions as a mid vowel for clean speakers. The fact that these two verbs have different vowels for clean speakers explains why the one appears to be exceptional in dirty speech. These data also require that ɔ/ɑ Shift be rewritten for clean speakers only.

ɒ/ɑ Shift

ɒ ⟶ ɑ / _____(ʔ)n

While we can explain the exceptionality of the verb *look at* by the loss of contrast between two back vowels, it is not clear if the same explanation accounts of the other exceptional verbs listed in (15) since I do not have data reflecting how clean speakers pronounce those verbs.

In clean speech the vowel a follows palatal consonants, not ɑ. The vowel a is also the front vowel that appear in palatalized stems that are have an underlying ɒ. This is true even if the y has been deleted. Forms in (49) illustrate these occurences of a.

(49)

UF	3s hab.	gloss
ʒyɑ^{23}	ǰa^{23}	put
syɑ^{3}	ša^{3}	there is/are
kyɑ·^{3}	kya·^{3}	lie down
yɑ·n^{32}	ya·n^{32}	destroy
yɑ̣?n^{3}	yạ?n^{3}	owe
y+?ɔ·^{3}	?a·^{3}	guard
y+hwɔ?^{3}	hwa?^{3}	say
y+tɔ?^{23}	ta·?^{23}	drop
y+lɔ·^{23}	la·^{23}	wrap

Note that although I said that underlying ɒ becomes a in palatalized stems I still use the vowel ɔ in (49). That is because I have very little reliable data showing the contrast between ɒ and ɔ. Data showing the contrast between a and ɑ are reliable. Thus, I record those palatalized stems with the dirty speakers low back vowel. However, because of the presence of a in the palatalized forms such as *he guards*, I make the assumption that those verbs have an underlying vowel ɒ. This means that there is a different fronting rule for low vowels that fronts ɒ to a. That raises the question of whether clean speakers have yet another fronting rule that parallels low vowel fronting. Such a rule would have the following effect: ɔ ⟶ ɛ. If there is such a rule it would explain another problem of exceptionality. We saw that the verb *discuss* has the following palatalizing alternation: ?ɔ, ?ɛ that I was forced to treat as an unexplained irregular. If it can be shown that the underlying vowel in that verb is ɔ for clean speakers, then this verb would be an example of just such a fronting rule. In support of this hypothesis it may be seen that in some cases proto *ə became LC ɔ and that LC ɒ came from proto *ɑ (Rensch 1968:78-80). If all of my assumptions are correct then the fronting rules may be ammended to account for clean speech phenomena. Since in (49) we see that clean speakers have a rule like (50)

(50) ɑ ⟶ a / [+palatal] _____

it should be possible to combine this rule with the existing Vowel Fronting rule. The following rules describe vowel fronting for clean speakers:

Vowel Fronting I

$$\begin{bmatrix} V \\ +hi \\ -front \end{bmatrix} \longrightarrow [+front] \,/\, [+palatal] \_\_\_\_$$

Vowel Fronting II

$$\begin{bmatrix} V \\ -front \\ -back \end{bmatrix} \longrightarrow [+front] \,/\, [+palatal] \_\_\_\_$$

Vowel fronting I fronts ɨ and ʉ to i and ü respectively. Vowel Fronting II fronts ə and ɑ to ɛ and a respectively.

Clean speakers have a different formulation for the ɔ Fronting rule.

Low Vowel Fronting

$$\begin{bmatrix} V \\ +back \\ -hi \end{bmatrix} \longrightarrow [-back] \,/\, y+ \_\_\_\_$$

This rule fronts ɔ and ɒ to ə and ɑ respectively. Notice that this rule only fronts to a central vowel, but as will be seen shortly further fronting will give the correct output.

These rule for clean speakers interact in a way that dirty speakers rules did not. Low vowel fronting only fronts to a central vowel. These vowels then become input to Vowel Fronting II which gives them the correct surface vowel. Consider the following derivations where I assume underlying ɒ for *we guard*.

(51)

	we guard	*we discuss*	*he puts*
UF	y+ʔɒ·3	y+ʔɔ3	ʒyɑ23
OR	ʔyɒ·3	ʔyɔ3	ǰɑ23
Low V Fronting	ʔyɑ·3	ʔyə3	------
V Fronting II	ʔya·3	ʔyɛ3	ǰa23
OR	ʔa·3	ʔɛ3	------
SF	ʔa·3	ʔɛ3	ǰa23

This analysis of clean speech is speculative until it can be verified by checking the appropriate forms with a practitioner of clean speech. In the meantime it does present a reasonable explanation for some residue from the dirty speech analysis.

5.0 WHY y-?

There are only a very few verbs in LC that give clear evidence that there is a y involved in the alternation of vowels and consonants. The following stems demonstrate a clear alternation with a y in evidence.

(52)	2p. hab.	1p hab.	gloss
	u·^{3}	yö·^{3}	extinguish
	kɔ^{3}	kyɛ^{3}	carry
	ʔɔʔ^{3}	ʔyɔʔ^{3}	sweep
	ʔən^{23}	ʔyɛn^{232}	rinse corn

These are the only examples in my data that support the underlying y hypothesis. In light of this less than overwhelming evidence, I want to present other facts in support of this interpretation.

5.1 Distribution. CV sequences, when laid out in graphic display, present some tantalyzing holes in the distributional pattern. In (53) these sequences are presented in a distribution chart comparing palatal onsets to non-palatal onsets.

(53)

	i	i̱	ü	ɨ	ɛ	ə	ɑ	ɔ
s		×		×		×	×	×
ʒ		×		×		×	×	×
k	×	×		×		×	×	×
g	×	×		×		×	×	×
ŋ	×	×		×		×	×	×
ʔ	×	×		×	×	×	×	×
h	×	×		×	×	×	×	×
š	×		×	×	×		×	×
ǰ	×		×	×	×		×	×
ky			×	×	×		×	
gy			×	×	×		×	
ŋy			×	×	×		×	
ʔy			×	×	×		×	×
hy			×	×			×	×

The squares filled by x indicate those sequences that do occur and the vacant boxes indicate nonpermissable sequences.

In light of the analysis in this paper(based on the y- hypothesis), many of the holes in (53) can be explained. I want to consider the i and i̱ columns first. There appears to be a genuine contrast between i and i̱ when following k, g, ŋ, ʔ, and h. But this contrast disappears if we treat the sequences of those consonants followed by i as having an

underlying y that was deleted by Y Deletion I. The x's in the upper half of the i column in (53) can be moved to the lower half. This results in a set of exclusive environments for i and ɨ.

There is a slightly different problem with ü and u. According to (53) there is complete contrast of these vowels following palatals. This contrast disappears when we consider that all instances of u following a palatal are followed by n or ?n . All such u's are the result ü/u Shift. Thus all instances of palatal plus u are underlying palatal plus ü. Again the result is exclusive environments for these two vowels.

The vowels ɛ and ə exhibit contrast only following ? and h. In verbs that have palatalizing alternation we can see that the action of Y Deletion II removes underlying y and this results in forms like hɛ̨^{23} *he waits for*. If all sequences of laryngeal plus ɛ could be accounted for in this way, then I could show that ɛ and ə also have exclusive environments. However, Y Deletion II has a boundry marker in it that has the effect of limiting its operation to stems that have an underlying y- prefix. That leaves the problem of accounting for verbs that do not alternate such as ?ɛ^{3} *he sings* and a noun such as hɛ?^{2} *toad*. I have a suspicion that historically there was a rule something like the following:

$$y \longrightarrow \emptyset \;/\; [+\text{laryngeal}] \_\_\_\_ \overset{V}{\begin{bmatrix} -\text{round} \\ +\text{front} \end{bmatrix}}$$

This rule would delete y following ? and h before i, ɛ and a. This rule has been changed by the addition of the boundry marker. It is also my suspicion that this change is still in progress and that accounts for the inconsistency with which we find sequences such as ?yɛ. I have already pointed out that two verbs are exceptional to Y Deletion II. There are also non-alternating verbs which retain y such as sɨ^{3}?yɛn^{23}nɑ^{23} mɨ^{23}ỵɔ·^{232} *I am perspiring*.

The situation with ɔ and ɑ is much more resistant to analysis. It has already been shown that these vowels alternate in palatalizing environments. These same two vowels are involved in ɔ/ɑ Shift. Even though it can be shown that many ɑ's are the result of these rules there are many that are not. Rensch (1968:65) has shown that proto *ɑ has the reflexes ɔ and ɑ in LC. Thus, contrasts do exist.

It can be seen from this discussion that, while not all questions have been answered, the underlying y- hypothesis gives considerable help in explaining the peculiar distribution of vowels.

5.2 Comparative Evidence. It was noted that the palatalization pattern for consonants was somewhat defective. This is due to the fact that while vowel fronting takes place following t, n, l and w, these consonants never appear in surface forms followed by y nor do they have palatal alternants. The explanation the y- hypothesis gives is that y is deleted following those consonants by Y Deletion III. In support of an underlying y that triggers vowel fronting we find that palatal alternants of these consonants occur in several other Chinantec languages (Rensch 1968:19-32). The following list summarizes some of the occurences of those consonants in related languages.

(54)

Latani Chinantec	lʸ	tʸ	
Lealao Chinantec	lʸ	tʸ	
Ozumazín Chinantec	lʸ		
Valle Nacional Chinantec	lʸ	tʸ	possibly nʸ
Chiltepec Chinantec	lʸ	tʸ	nʸ

In addition to the segments in (54) we find that Palantla Chinantec has consonant y clusters for all consonants except labials (Rensch 1968:24). I interpret these data as supporting the y- prefix hypothesis as an analysis of palatalization in LC verb stems. The absence of y from many LC verb stems can be taken as a surface restriction peculiar to LC.

6.0 APPENDIX

6.1 Rule Summary.

(1) Y Metathesis

$$y\ C_1 \Rightarrow C_1\ y$$

(2) Y Coalescence

$$\underset{1}{[+\text{sibilant}]}\ \underset{2}{y} \Rightarrow \underset{1}{[+\text{sibilant}\ +\text{palatal}]}\ \ \underset{2}{\emptyset}$$

(3) ɔ Fronting

$$ɔ \longrightarrow ɑ \ /\ y+ \_\_\_\_$$

(4) ɻ Fronting

$$ɻ \longrightarrow ɾ \ /\ \frac{\_\_\_\_}{+\text{back}}$$

(5) ɑ̆/ɛ̆ Shift

$$ɑ̆ \longrightarrow ɛ̆ \ /\ \_\_\_\_ (ʔ)n$$

(6) ɔ/ɑ Shift

$$ɔ \longrightarrow ɑ \ /\ \_\_\_\_ (ʔ)n$$

(7) ɑ̆/ə̆ Shift

$$ɑ̆ \longrightarrow ə̆ \ /\ \_\_\_\_ (ʔ)n$$

(8) Vowel Fronting

$$\overset{C}{\begin{bmatrix}\text{-front}\\ \text{-low}\end{bmatrix}} \longrightarrow [\text{+front}] \;/\; [\text{+palatal}] \_\_\_\_$$

(9) Y Deletion I

$$y \longrightarrow \emptyset \;/\; \_\_\_\_ \; i$$

(10) Y Deletion II

$$y \longrightarrow \emptyset \;/\; [\text{+laryngeal}] \_\_\_\_ + \overset{V}{\begin{bmatrix}\text{-back}\\ \text{-hi}\end{bmatrix}}$$

(11) Y Deletion III

$$y \longrightarrow \emptyset \;/\; \begin{bmatrix}\text{+cons}\\ \text{- hi}\\ \text{-back}\end{bmatrix} \_\_\_\_$$

(12) ü/u Shift

$$ü \longrightarrow u \;/\; [\text{+palatal}] \_\_\_\_ (?)n$$

(13) W Nasalization

$$w \longrightarrow m \;/\; s \_\_\_\_ \overset{V}{[\text{+nasal}]}$$

(14) Lenition

$$\begin{Bmatrix}s\\ ʒ\end{Bmatrix} \longrightarrow \begin{Bmatrix}h\\ g\end{Bmatrix}$$

(15) Labial Deletion

$$\overset{C}{[\text{+labial}]} \longrightarrow \emptyset \;/\; \overset{C}{[\text{+sibilant}]} \_\_\_\_$$

(16) Sibilant Palatalization

$$\overset{C}{[\text{+sibilant}]} \longrightarrow [\text{+palatal}] \;/\; \_\_\_\_ \overset{V}{[\text{+front}]}$$

(17) ü Lowering

$$ü \longrightarrow ö$$

(18) ŋ Palatalization

$$ŋ \longrightarrow ŋ^{y} \;/\; \_\_\_\_ \; i$$

6.2 Derivations. The following derivations are given to demonstrate the interaction of the morphophonemic rules via the example of selected verb stems.

	you all grab	*you grab*	*we grab*	*you dance*	*we dance*
UF	swɔ?^{2} [+len]	swɔ?n^{2} [+len]	y+swɔ·?^{3}	ʒwɔ́n^{2} [+len]	y+ʒwɔ́n^{2}
Y Meta	-----	-----	swyɔ·?^{3}	-----	ʒwyɔ́n^{2}
Y Coal	-----	-----	-----	-----	-----
ɔ Front	-----	-----	swyɑ·?^{3}	-----	ʒwyɑ́n^{2}
ɑ Front	-----	-----	swyɛ·?^{3}	-----	-----
ɑ̈/ɛ̈	-----	-----	-----	-----	ʒwyɛ́n^{2}
ɔ/ɑ	-----	swɑ?n^{2}	-----	ʒwɑ́n^{2}	-----
ɑ̈/ə̈	-----	swə?n^{2}	-----	ʒwə́n^{2}	-----
V Front	-----	-----	-----	-----	-----
Y Del I	-----	-----	-----	-----	-----
Y Del II	-----	-----	-----	-----	-----
Y Del III	-----	-----	swɛ·?^{3}	-----	ʒwɛ́n^{2}
ü/u	-----	-----	-----	-----	-----
Lab. Nas.	smɔ?^{2}	smə?n^{2}	smɛ·?^{3}	-----	-----
Lenition	hmɔ?^{2}	hmə?n^{2}	-----	gwə́n^{2}	-----
Lab. Del.	-----	-----	sɛ·?^{3}	-----	ʒɛ́n^{2}
Sib Pal	-----	-----	šɛ·?^{3}	-----	ǰɛ́n^{2}
ü Lower	-----	-----	-----	-----	-----
ŋ Pal	-----	-----	-----	-----	-----
SF	hmɔ?^{2}	hmə?n^{2}	šɛ·?^{3}	gwə́n^{2}	ǰɛ́n^{2}

	you all say	*you say*	*he says*	*you said*	*they will convene*
UF	hwɔʔ^{3}	hwɔʔn^{3}	y+hwɔʔ^{3}	y+hwɔʔn^{2}	y+ŋɨ·ʔn^{23}
Y Meta	-----	-----	hwyɔʔ^{3}	hwyɔʔn^{2}	ŋyɨ·ʔn^{23}
Y Coal	-----	-----	-----	-----	-----
ɔ Front	-----	-----	hwyɑʔ^{3}	hwyɑʔn^{2}	-----
ɑ Front	-----	-----	-----	-----	-----
ɑ̆/ɛ̆	-----	-----	-----	hwyɛʔn^{2}	-----
ɔ/ɑ	-----	hwɑʔn^{3}	-----	-----	-----
ɑ̆/ə̆	-----	hwəʔn^{3}	-----	-----	-----
V Front	-----	-----	-----	-----	ŋyi·ʔn^{23}
Y Del I	-----	-----	-----	-----	ŋi·ʔn^{23}
Y Del II	-----	-----	-----	-----	-----
Y Del III	-----	-----	hwɑʔ^{3}	hwɛʔn^{2}	-----
OR	-----	-----	-----	-----	-----
ŋ Pal	-----	-----	-----	-----	ŋʸi·ʔn^{23}
SF	hwɔʔ^{3}	hwəʔn^{3}	hwɑʔ^{3}	hwɛʔn^{2}	ŋʸi·ʔn^{23}

	we hear	*you heard*	*we tease*	*we pay*	*we wait for*
UF	y+nɥ·^{3}	y+nɥ́·n^{2}	y+sɥ·n^{232}	y+kɨ^{232}	y+hɕ^{3}
Y Meta	nyɥ·^{3}	nyɥ́·n^{2}	syɥ·n^{232}	kyɨ^{232}	hyɕ^{3}
Y Coal	-----	-----	šɥ·n^{232}	-----	-----
ɔ Front	-----	-----	-----	-----	hyɑ^{3}
ɑ Front	-----	-----	-----	-----	hyɛ^{3}
ɑ/ɛ	-----	-----	-----	-----	-----
ɔ/ɑ	-----	-----	-----	-----	-----
ɑ/ə	-----	-----	-----	-----	-----
V Front	nyɥ̈·^{3}	nyɥ̈́·n^{2}	šɥ̈·n^{232}	kyi^{232}	-----
Y Del I	-----	-----	-----	ki^{232}	-----
Y Del II	-----	-----	-----	-----	hɛ^{3}
Y Del III	nɥ̈·^{3}	nɥ̈́·n^{2}	-----	-----	-----
ü/u	-----	-----	šɥ·n^{232}	-----	-----
OR	-----	-----	-----	-----	-----
ü Lower	nɵ̈·^{3}	nɵ̈́·n^{2}	šɥ·n^{232}	-----	-----
ŋ Pal	-----	-----	-----	-----	-----
SF	nɵ̈·^{3}	nɵ̈́·n^{2}	šɥ·n^{232}	ki^{232}	hɛ^{3}

6.3 Palatalizing Verbs. This is a complete listing of those verb morphemes which have palatalizing alternation. This listing displays two inflections which do not undergo palatalization (2p and 2s habitual) and two inflections which do undergo palatalization (1p habitual and 2s completive). The second forms in each of these pairs are closed by the -n suffix and thus may involve shift rules in their derivation. These forms show every possible alternation generated by the rules described in this paper (except clean speech). P Pattern verbs are treated separately at the end. The underlying forms shown are not the UF of any particular inflection, but are a representation of the stem morpheme. Some UF's have two forms because it is impossible to determine which is the correct form. Either UF will generate the correct surface forms. An asterisk in the left margin indicates that that verb has a vowel alternation that is unexplained.

	UF	2p hab.	2s hab.	1p hab.	2s comp.	gloss	pattern
	u·	u·^{3}	u·n^{3}	yö·^{3}	yú·n^{2}	extinguish	U
	ʔɔ·	ʔɔ·^{3}	ʔɑ·n^{3}	ʔɑ·^{3}	ʔɑ́·n^{2}	guard	U
	ʔɔ	ʔɔ^{3}	ʔən^{3}	ʔɛ^{3}	ʔén^{2}	discuss	U
	ʔɔn ʔən	ʔən^{23}	ʔən^{23}	ʔyɛn^{232}	ʔyɛn^{23}	rinse corn	U
	ʔɔʔ	ʔɔʔ^{3}	ʔəʔn^{3}	ʔyɔ·ʔ^{3}	ʔyɛ·ʔn^{3}	sweep	U
	ʔɨ·n	ʔɨ·n^{23}	ʔɨ·n^{23}	ʔi·n^{232}	ʔi·n^{23}	hang	L
	ʔɨ·	ʔɨ·^{3}	ʔɨ·n^{3}	ʔi·^{3}	ʔí·n^{3}	explain	L
	ʔɨ·n	ʔɨ·n^{3}	ʔɨ·n^{3}	ʔi·n^{3}	ʔi·n^{3}	pull	L
	ʔɨ	ʔɨ^{3}	ʔɨn^{3}	ʔi^{3}	ʔín^{3}	count	L
	ʔɨ·ʔ	ʔɨʔ^{3}	ʔɨʔn^{3}	ʔi·ʔ^{3}	ʔiʔn^{3}	poke	L
*	ʔɨ̱·ʔ	ʔuʔ^{3}	ʔuʔn^{3}	ʔɨ̱·ʔ^{3}	ʔɨ̱ʔn^{3}	drink	L
	ʔnɻʔ	ʔnɻʔ^{3}	ʔnɑʔn^{3}	ʔnɛ·ʔ^{232}	ʔnɛ·ʔn^{23}	search for	L
	ʔnɻ·	ʔnɻ·^{3}	ʔnɑ·n^{3}	ʔnɛ·^{3}	ʔnɛ́·n^{3}	gather	L
	gɨ·	gɨ·^{3}	gɨ·n^{3}	gi·^{3}	gi·n^{3}	tear	L
	hɻ	hɻ^{3}	hɻn^{3}	hɛ^{3}	hɛ́n^{2}	wait for	U
	hən hɔn	hən^{23}	hən^{23}	hɛn^{232}	hɛn^{23}	call	U
*	hɨ̱	hu^{3}	hun^{3}	hɨ̱^{3}	hɨ̱n^{3}	set afire	L
*	hɨ̱·ʔ	hu·ʔ^{3}	huʔn^{3}	hɨ̱·ʔ^{3}	hɨ̱ʔn^{3}	smell	L

UF	2p hab.	2s hab.	1p hab.	2s comp.	gloss	pattern
hɨ·	hɨ·^{3}	hɨ·n^{3}	hi·^{3}	hí·n^{3}	chop down	L
hlɨ·ʔ	hlɨʔ^{3}	hlɨʔn^{3}	hli·ʔ^{3}	hliʔn^{2}	dissolve	U
hnɨ	hnɨ^{3}	hnɨn^{3}	hnį^{3}	hnín^{2}	close	U
hwɔʔ	hwɔʔ^{3}	hwəʔn^{3}	hwɑ·ʔ^{3}	hwɛʔn^{2}	say	U
hwəʔn	hwəʔn^{23}	hwəʔn^{23}	hwɛ·ʔn^{232}	hwɛ·ʔn^{232}	frighten	U
hwɔʔn						
kɨ	kɨ^{3}	kɨn^{3}	ki^{232}	kín^{2}	pay	U
kɨ·ʔ	kɨʔ^{3}	kɨʔn^{3}	ki·ʔ^{3}	kiʔn^{3}	dress	L
kɨ·	kɨ·^{3}	kɨ·n^{3}	kį·^{3}	kí·n^{3}	tie grass	L
kɨ·ʔn	kɨʔn^{3}	kɨʔn^{3}	kį·ʔn^{3}	kį·ʔn^{3}	cover	L
kǫ	kǫ^{3}	kǫn^{3}	kyę^{3}	kyęn^{3}	take	L
ʒwən	gwén^{2}	gwén^{2}	ǰén^{2}	ǰén^{2}	dance	L
ʒwɔn						
* ʒwɨ	gwɔ^{3}	gwən^{3}	ǰi^{3}	ǰín^{3}	grind	L
lɔ·	lɔ·^{3}	lɑ·n^{3}	lɑ·^{3}	lá·n^{2}	wrap	U
lɔ	lɔ́^{3}	lán^{3}	lɑ^{232}	lén^{2}	buy	L
lɔ·ʔ	lɔʔ^{3}	lɑʔn^{3}	lɑ·ʔ^{232}	lɑ·ʔn^{23}	bathe	L
lɔ·	lɔ́·^{3}	lá·n^{3}	lɑ·^{23}	lɑ·n^{23}	begin	L
nǫ	nǫ́^{3}	nǫ́n^{3}	nę^{232}	nę́n^{2}	open	U
nų·	nų·^{3}	nų·n^{3}	nǫ̈·^{3}	nǫ̈́n^{2}	hear	L
swɨ·ʔ	hwɨ·ʔ^{32}	hwɨ·ʔn^{32}	šį·ʔ^{32}	šiʔn^{2}	tell	L
sɨ·ʔ	sɨʔ^{3}	sɨʔn^{3}	šį·ʔ^{23}	šiʔn^{23}	pour	U
sɨ·ʔ	sɨʔ^{3}	sɨʔn^{3}	šį·ʔ^{3}	šiʔn^{3}	set up	U
sɨ·n	sɨ·n^{23}	sɨ·n^{23}	šį·n^{232}	šį·n^{23}	send	U
sɔ·	hɔ·^{3}	hɑ·n^{3}	šɔ·^{3}	šá·n^{3}	boil	L
swəʔ	hwəʔ^{3}	hwə·ʔn^{3}	šɛ·ʔ^{232}	šɛ·ʔn^{23}	drag	L
swǫʔ	hmǫʔ^{2}	hməʔn^{2}	šę·ʔ^{3}	šę·ʔn^{3}	grab	L
swəʔn	hwəʔn^{23}	hwəʔn^{23}	šɛʔn^{23}	šɛʔn^{23}	pull out	L
swɔʔn						

UF	2p hab.	2s hab.	1p hab.	2s comp.	gloss	pattern
sɥ·ʔ	hɥʔ ^{3}	hɥʔn^{3}	šö̤·ʔ^{232}	šö̤·ʔn^{23}	break	L
sɥ·n	hu·n^{23}	hu·n^{23}	šɥ·n^{232}	šɥ·n^{232}	tease	U
tɔʔ	tɔ·ʔ^{3}	tə·ʔn^{3}	tɑ·ʔ^{3}	tɛʔn^{2}	drop	U
tɔ·	tɔ·^{3}	tɑ·n^{3}	tɑ·^{3}	tɑ·n^{3}	cook	U
tɻ·	tɻ·^{3}	tɻ·n^{3}	tɻ·^{3}	tɻ́·n^{3}	discard	L
tɻʔ	tɻʔ^{3}	tɻ·ʔn^{3}	tɻʔ^{232}	tɻ·ʔn^{23}	insert	L
tɔ·ʔ	tɔ·ʔ^{32}	tɑ·ʔn^{32}	tɑ·ʔ^{32}	tɑʔn^{2}	insert	L
tɔn	tən^{23}	tən^{23}	tɛn^{232}	tɛn^{232}	spy	U
tə	tə^{32}	tən^{32}	tɛ^{3}	tɛn^{3}	call	L
tu·	tu·^{3}	tu·n^{3}	tö·^{3}	tö́n^{2}	defecate	L
tɥ·	tɥ·^{3}	tɥ·n^{3}	tö̤·^{3}	tö̤́·n^{2}	spill	U
tu	tu^{32}	tun^{32}	tö^{232}	tön^{2}	abandon	U
tuʔ	tuʔ^{3}	tuʔn^{3}	tö·ʔ^{3}	tö·ʔn^{3}	suck	U

	3s comp.	3s pot.		
hŋɨ·n	hŋɨ·n^{3}	hŋʸín^{3}	clear up	P
hlɔʔ	hlɔʔ^{3}	hlɑʔ^{3}	err	P
hwɨ·	hwɨ·^{3}	hwi·^{3}	ripe	P
ʔlɔ·	ʔlɔ́·^{3}	ʔlɑ́·^{3}	recover	P
kɨ·n	kɨ·n^{3}	kɻ·n^{3}	back up	P
kɻʔn	kɻ̀ʔn^{23}	kyɛʔn^{23}	fill up	P
ʒɔʔ	ʒɔʔ^{23}	ǰɔʔ^{23}	find	P
ʒɔ·	ʒɔ·^{23}	ǰɔ·^{23}	exhaust	P
ŋɨ·ʔn	ŋɨ·ʔn^{23}	ŋʸi·ʔn^{23}	convene	P
tɨ·ʔn	tɨ·ʔn^{23}	ti·ʔn^{23}	find	P
wɨ·ʔn	wɨ·ʔn^{3}	wɻ·ʔn^{23}	to wound	P

NOTES:

1. Lalana Chinantec is spoken by approximately 10,000 people in the municipalities of Lalana, Jocotepec and Petlapa about 70 miles northeast of the city of Oaxaca, México. The data for this paper were gathered during various periods of residence in the community of Arroyo Arena since May 1971. All of the data were supplied by Macario Sánchez Bautista and Fidel Sánchez Bautista, both of whom reside in Arroyo Arena. Both of these good friends labored long hours to compile verb paradigms for this study. This work has been done under the auspices of the Summer Institute of Linguistics in México. I want to express my deep gratitude to Richard Rhodes to whom I am indebted for the theoretical orientation of this paper and for his untiring assistence in the analysis.

2. According to this analysis the phonemes of LC are: stops p, t, k, b, d, g; fricatives s, š; affricates ʒ, ǰ; vibrant r; lateral l; nasals m , n, ñ, ŋ; semivowels w, y; segmental prosody phonemes ?, h; vowels i, ɛ, ö, ɑ, ɨ, ə, u, ɔ; prosody phonemes consisting of vowel length, vowel nasalization, tone (1=high, 2=mid, 3=low). In the present paper I deviate from the above analysis slightly. I analyze ñ as the sequence ŋy and in some cases $ŋ^{y}$. I have also posited the high front rounded vowel ü which underlies ö. The segmental prosody phonemes I treat as laryngeal consonants except when h occurs post-vocalically I treat it as the prosody feature 'ballistic syllable' marked by acute accent.

3. In rule names and formulae I have adopted the following conventions. A vowel with a breve mark over it indicates a short vowel. A vowel with no mark over it may be either long or short. Nasalization is only marked where it is relevant. In citations of LC words vowel length is marked as V·.

4. LC uses an aspect system in its verbs. The three aspects that are relevant with regard to this study are habitual (hab.), potential (pot.), and completive (comp.).

5. All other vowel shift rules that are conditioned by -n also undergo the shift before either morpheme -n. Therefore, in examples used to illustrate other vowel shifts I will not give data from transitive animate stems. It is sufficient to give data that show the shift before person marking -n only.

6. Exceptional data are treated as if the stem carries a minus rule feature indicating the rule to which it is an exception.

7. Patterns L and U correspond to patterns of segmental alternation that Merrifield (1968:39) designates B and C in Palantla Chinantec. Rensch (1968:63) refers to the U pattern as a common pattern in Proto-Chinantec.

8. An alternate analysis treats the underlying y as an infix. It is my judgment that both analyses are equivalent.

9. Many verbs which have a post- vocalic glottal stop undergo a vowel length shift in some inflections. Vowel length shifts are as yet unanalyzed and outside the scope of this paper.

10. In derivations I use the abbreviation OR for Other Rules and SF for Surface Form.

11. I am indebted to Rich Rhodes for this notational device.

12. The presence of ɔ in gwɔ^3 *you all dance* is not to be expected. I have no explanation for it.

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